Sandia National Laboratories

Technology / Capabilities Summary Guide

In the course of our mission to mitigate the consequences of national weapons production for the Department of Energy, the Critical Resources Program at Sandia National Laboratories has developed many technologies and capabilities to address environmental contamination that are applicable to a broad range of challenges.

This guide provides short descriptions of Critical Resources Program environmental technologies, capabilities, and facilities in the following categories.

- ***Characterization and Monitoring***
- ***Containment and Barriers***
- ***Modeling and Decision Analysis***
- ***Treatment and Removal***
- ***Related Projects, Facilities and other Capabilities***

Detailed fact sheets and contact information are available for all technologies and programs at **http://www.nwer.sandia.gov/wlp**

3-D Electromagnetic Imaging

Non-invasive techniques for shallow subsurface characterization of environmental sites, including wave migration and extrapolation, holography, integral wave-migration, inversion of airborne electromagnetic data, integral equation, and wideband three-dimensional inversion using finite-difference forward modeling.

Advanced *In Situ* Moisture Logging

System measures moisture content and soil density around access tubing within the soil/rock medium, providing an alternative to costly monitor well networks for vadose zone monitoring.

Automated Multiscale Permeameter

An instrument for precise, rapid, and nondestructive measurement of matrix permeability on slabs and blocks of rock. Permeability maps are generated over a range of different measurement scales allowing detailed investigation of spatial permeability characteristics and permeability upscaling relations.

Automated Two-Phase Flow Test System

Measures flow properties of low-permeability porous media under simulated *in situ* pressure conditions. Measurements are used in numerical analysis to evaluate liquid and/or gas flow to determine if fluid flow is within limits set by regulatory agencies, if a reservoir or repository seal material is effective, or to characterize flow in a hydrocarbon reservoir.

Characterization of Brittle Materials Under Multiaxial Loading

Experimental techniques to simulate inertial confinement experienced by materials during shock-wave actuation, and to investigate changes in deformation and failure mechanisms as functions of confining pressure, strain rate, and temperature. Provides accurate constitutive models and mechanical properties of materials for numerical simulation of prototype designs.

Characterization of the Erodibility of Sediments in Marine Environments

Investigation of the erodibility of sediments as a function of consolidation. *In situ* analysis cores are used to determine bulk density, particle size, mineralogy and organic carbon content as a function of depth. Determination of the short and long-term fate of materials disposed in the marine environment contributes to site monitoring and disposal site capacity estimations.

Characterization and Monitoring

Cross Borehole Electromagnetic Imaging

EM imaging with continuous wave and pulsed radar systems to determine geohydrologic flow control, monitor barriers, and detect source and contaminant migration for environmental site characterization and monitoring.

Cross Well Seismic Imaging

For both characterization and monitoring, seismic crosswell imaging can provide valuable geophysical information about the subsurface with relatively little intrusion into the site, especially if preexisting boreholes are present.

Environmental Fate and Transport of Chemical Signatures

Tracking the movement of chemical signatures through soils is important in defining performance requirements and improving operational use of chemical sensing systems. Current applications are for detection of buried landmines and military range pollution from detonation residues.

Environmental Measurement While Drilling

A unique site assessment tool with downhole sensors (full gamma spectrometer and position location capability) located behind the drill bit linked by a high-speed data transmission system to a computer on the surface. This system is used for real-time field screening and decision-making while drilling during site assessment activities.

Fiber Optic Relative Humidity and TDR Sensors for the Cone Penetrometer

Real-time, continuous measurement for the quantification of volumetric soil moisture content (Time Domain Reflectometry sensor) and capillary pore pressure in unsaturated soils (Fiber Optic Relative Humidity sensor). These sensors provide accurate hydrogeologic characterization for risk assessments, contaminant transport models, and optimization of remedial alternatives such as soil venting and bioremediation. The technology is being extended for ephemeral stream sediment measurements.

Field-Scale Tracer Testing

Determination of controlling transport processes in fractured and heterogeneous subsurface environments for the design and implementation of effective contaminant remediation and demonstration of safe disposal of radioactive and/or hazardous wastes.

Flow Probe™ Chemical Analyzer

An *in situ* generic chemical speciating technology that measures chemicals in both liquid and gas states for field survey and process monitoring applications. This technology can be used wherever reagent-based chemistry exists that provides chemical concentration changes detectable by optical absorption spectroscopy.

Characterization and Monitoring

Geostatistical Modeling of Spatially Heterogeneous Material Properties

Geostatistical estimation and simulation techniques for modeling spatial variability from limited sample sets to predict the spatial distribution of physical and hydrological properties in natural materials. Uncertainty in the spatial prediction is quantified.

Geosynthetic Membrane Monitoring System (GMMS)

"Smart" landfill covers and linings that incorporate fiber optic sensors embedded in geosynthetic membrane for monitoring the effects of water accumulation, subsidence, and age.

Geotechnical Studies and Engineered Barriers

Site characterization and performance assessment. Evaluation of waste form degradation in high ionic strength media, design/development of waste encapsulation technology, *in situ* geotechnical experiments.

Hybrid Cost-Effective Directional Drilling Equipment

Equipment provides relatively shallow horizontal drilling beneath an environmental site without adding fluids. This technique allows earlier access to developing contaminant plumes and less risk to water tables than standard methods.

Hybrid Hydrologic-Geophysical Inverse Technique for Assessment and Monitoring in the Vadose Zone

Combines information from electrical resistance tomography (ERT), statistical information about the site geology, and sparse data on moisture and contaminant distributions to provide improved estimates of hydraulic properties and three-dimensional contaminant distributions.

***In Situ*, Three-Dimensional Flow Velocity Measurement**

An *in situ* permeable flow sensor and associated analysis techniques allow direct measurement of the 3-dimensional flow velocity vector in unconsolidated, saturated, porous media, providing accurate information about the ground-water flow field for waste disposal and contaminant remediation problems.

Landfill Assessment and Monitoring System (LAMS)

LAMS assesses hazardous and mixed waste contaminants, their sources, and their migration beneath landfills. This systems approach efficiently integrates the best available and emerging technologies with emphasis on minimally intrusive technologies and downhole sensors for landfill assessment.

Low Temperature Fluid-Mineral Interactions

Characterization, modeling and analysis of interfacial and kinetic parameters of geochemical processes in aqueous fluid-mineral interactions.

Magnetometer Towed Array

A vehicle-based system deploying a non-intrusive sensor platform containing seven total-field magnetometers with precise satellite positioning for locating buried ferrous objects such as drums and tanks. Provides automated, rapid, high-resolution, non-intrusive characterization of buried hazardous waste.

Magnetostrictive Borehole Seismic Source

A versatile downhole seismic source specifically for environmental monitoring and characterization applications to provide subsurface characterization and monitoring information.

Micro-Chemical Sensors for *In Situ* Monitoring and Characterization of Volatile Contaminants

Microsensor system for real-time monitoring of VOCs in the subsurface provides cheaper and more reliable information than traditional approaches. Unique characterization methods are being developed that utilize contaminant transport models and time-dependent, *in situ* sensor data to quantify contaminant location, composition, and other features and transport processes.

SEAMIST™ Instrumentation/Sampling System

Flexible borehole lining technology that can be used to keep boreholes open and emplace borehole instrumentation and fluid sampler. The system protects instruments and reinforces hole walls to facilitate accurate hydrogeologic investigations via drilled or punched wells.

SEAtrace™

Gaseous tracer injection and in-field real-time gas analysis and data interpretation are used to evaluate barrier integrity. This system integrates an automatic, multipoint soil vapor sampling system with a data analysis system using an inverse global optimization code to pinpoint leak locations, sizes, and the time leaks started.

Subsurface Gas Flow Probe

An inexpensive, easily deployable probe to monitor subsurface gas glow velocity for air sparging and vapor extraction experiments and operations in the vadose zone. The probe provides data for assessing the effectiveness of the operation.

Tomography and Radionuclide Transport Laboratory

Analysis, large-scale testing, experimental and modeling capabilities for characterization, monitoring, and visualization of radionuclide transport in fractured porous media.

Transmitted Light Imaging

A high-resolution (spatial and temporal), 2-D laboratory-based system to visualize and quantifty multiphase flow and transport processes in engineered systems (e.g., sand packs, fracture casts).

Vadose Zone Monitoring System

A stand-alone field system of integrated pressure sensors and gas samplers for real-time measurement at up to 64 sampling ports in either single or multiple wells. Monitoring the vadose zone beneath remediated sites permits early detection of contaminant releases at smaller volumes than standard groundwater well monitoring.

Visualization and Quantification of Diffusion Processes in Consolidated Materials

A unique, high-resolution x-ray absorption imaging system to visualize and quantify diffusion processes occurring in heterogeneous, opaque systems (i.e. rock slabs, natural soils, and ceramic plates). Understanding and predicting matrix diffusion and its effect on contaminant migration can be critical to environmental remediation programs and nuclear waste storage.

XRD Mineralogy and SEM/EDS Mineral Coating Work

Quantitative analysis of mineral properties and associated surface coatings are necessary to determine both physical and chemical transport of contaminants.

X-Ray Absorption Imaging System

A high-resolution (spatial and temporal), 2-D laboratory-based system to visualize and quantify multiphase flow and transport processes in natural systems (e.g., rock slabs, soils).

Alternative Landfill Cover Demonstration (ALCD)

Alternative landfill covers for arid and semi-arid climates that are more effective and easier and less expensive to install than existing EPA approved cover systems. The program makes supporting data available to those applying for permitting.

Capillary Barrier Landfill Cover

Capillary barriers, consisting of fine-over-coarse soil layers, are being developed as a long-lived, easily constructed, and low-cost alternative to conventional surface cover systems. Capillary barriers emphasize the use of natural processes and materials to prevent migration of landfill constituents.

Dry Barrier Applications for Landfills

Active or passive landfill cover systems that use air flow to dry a layer of geologic material, evaporating water that enters the system to prevent its becoming lechate, limiting its downward movement through waste and subsequent mobilization of hazardous constituents.

Geosynthetic Membrane Monitoring System (GMMS)

Investigation of the use of fiber optic sensors embedded in geosynthetic membrane for monitoring the effects of water accumulation, subsidence, and age in landfills.

Geotechnical Studies and Engineered Barriers

Site characterization and performance assessment. Evaluation of waste form degradation in high ionic strength media, design/development of waste encapsulation technology, *in situ* geotechnical experiments.

In Situ Reactive Barrier Systems

A reactive subsurface barrier is produced by emplacing a reactant material in the flow path of the contaminated groundwater, which removes and/or transforms the contaminant(s) to regulatory acceptable levels.

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Subsurface Barrier Systems

Permeation and jet grouting are used to emplace horizontal barriers capable of confining leaking waste sites without disturbing them. This technology is an interim measure to mitigate or prevent the spread of contamination to groundwater at old unlined hazardous waste sites.

Analysis of Long Term, Regional-Scale Ground-Water Flow

A multi-disciplinary approach to determining the impact of long-term, regional-scale flow on local-scale flow and transport that includes geologic, hydrologic, and chemical characterization; analysis of paleo climates; development of advanced numerical codes; and visualization of simulation results.

Atomistic and Molecular Simulations in Geochemistry and Materials Science

Simulation of geochemical and material processes for bulk mineral structure refinement, characterization of surface relaxation, metal and organic ion sorption mechanisms, ionic diffusion rates and mechanisms, ceramic growth morphology, and other mechanisms.

Contaminant Transport in Subsurface Environments: Analysis of Multi-Rate Diffusive Transport

Recognition and modeling of multi-rate diffusion processes, and simplified modeling approaches for appropriate incorporation of multi-rate diffusion in site-scale performance assessment models.

DEPOT: A Database of Environmental Parameters, Organizations, and Tools

A web-based central warehouse for data essential for environmental risk assessment analyses, providing site-specific performance assessment data, pathway-specific transport data, toxicity and carcinogenicity data, and links to environmental regulations, environmental parameter databases, and risk assessment models.

Discrete Element Modeling

2- and 3-D discrete element codes allow modeling of physical processes that involve the disaggregation and movement of discontinuous materials. The modeling methodology is especially adept at simulating granular or weakly cemented materials such as gravel, sand, rock, and ceramics that are subjected to various external and fluid-induced forces.

DNAPL Modeling Approach

A probabilistic modeling approach produces a probability map of potential dense non-aqueous phase liquids location. Multiple simulations of DNAPL migration capture the physics of DNAPL movement through the geologic features controlling DNAPL migration.

Explosive Structure Interaction

Computational modeling to aid in understanding the effects of explosives on public structures and facilities, for instance civilian tunnels that carry highways under cities, mountains, and waterways.

Modeling and Decision Analysis

Geomechanics for Reservoir Management

Integrated analysis of how mechanical and fluid-flow behavior of reservoirs evolve with production-induced changes in effective stress state.

- Description and Quantitative Analysis of Fracture Systems
- Microscale Modeling of Pore Structure and Fluid Flow
- Advanced Laboratory Testing

Geostatistical Modeling of Spatially Heterogeneous Material Properties

Geostatistical estimation and simulation techniques for modeling spatial variability from limited sample sets to predict the spatial distribution of physical and hydrological properties in natural materials. Uncertainty in the spatial prediction is quantified.

Hybrid Lagrangian-Eulerian Model of HydroGeoChemical Transport (LEHGC)

Finite-element modeling of hydrogeochemical transport through saturated/unsaturated media, LEHGC solves a system of transport and geochemical equilibrium equations for superior solution of advection-dominated problems.

Lattice Boltzmann Calculations of Flow, Dispersion and Reaction

Modeling of complex interfacial processes without gridding constraints, these 2- and 3-D codes calculate fluid flow, dispersion, dissolution, precipitation, and melting in multi-component systems.

Low Temperature Fluid-Mineral Interactions

Characterization, modeling, and analysis of interfacial and kinetic parameters of geochemical processes in aqueous fluid-mineral interactions. Geochemical modeling using equilibrium and non-equilibrium reactive transport experiments, computer simulations, and predictions.

Material Behavior Under Impulsive Loading

Predictive modeling of the effect of strain rate on strength, the location of the critical strain rate, and the influence of confining pressure on the strain-rate effect in materials.

Microscale Characterization and Modeling of Porous Media

High-resolution 3D imaging techniques, including confocal microscopy, syncrotron microtomography, and conventional serial sectioning, are coupled with 3D numerical fluid flow simulators to understand the macroscopic transport properties of complex porous media.

Near Wellbore Mechanics

Predictive modeling of sand production behavior in wells using discrete element methods (DEM) coupled with computational fluid flow techniques.

Numerical Simulation of Reservoir Behavior During Primary and Secondary Recovery

Nonlinear finite element codes use iterative solution methods to enable the analysis of large-scale, complex geosystems and capture the inelastic behavior of pressure-sensitive geomaterials to improve understanding of the geomechanical processes associated with recovery of hydrocarbons from oil and gas reservoirs.

Performance Assessment and Regulatory Compliance

Estimation of long-term performance of deep geologic disposal sites for high-level and transuranic radioactive waste, providing quantitative estimates of overall performance and the uncertainty associated with the behavior of engineered and natural systems over very long periods of time. Includes characterization of significant features, events, and processes and numerical modeling of system aspects such as waste mobilization and groundwater flow.

- Model Development
- Characterization of Uncertainty in Models and Data
- Code Linkage and System-Level Monte Carlo Modeling
- Uncertainty and Sensitivity Analysis
- System Prioritization
- Demonstrating Regulatory Compliance

Performance, Risk, and Decision Analysis (PRDA)

Probabilistic decision support tools that enable site owners to establish site-specific remediation goals, prioritize data needs, and evaluate health risks and costs associated with remediation alternatives that incorporate uncertainty and public concerns.

POR-SALSA: A Numerical Simulator for Nonisothermal Multiphase Subsurface Flow on Massively Parallel Architectures

An advanced research and development code for efficient simulation of very large multiphase flow problems using unstructured grids. This code provides a tool for investigation and analysis of a wide range of geoscience problems involving flow and contaminant transport in heterogeneous media.

Proliferation Resistance Analysis Tool (PRAT)

Models various alternative configurations and safeguards postures to compare the proliferation resistance of different options for processing, storing, transporting, and disposing of spent nuclear fuel.

RAMPART: Risk Assessment Method - Property Analysis and Ranking Tool

A risk-based decision support tool that allows property managers to assess the risks of death, injury, and loss of mission, property, contents, or use as a result of several natural and man-made hazards.

Risk Assessment for Nuclear Waste Management

Answers the three questions about risks associated with the management of spent fuel from reactors, high-level waste, transuranic waste, mixed wastes, and special wastes from defense programs.

- What can happen? (scenarios)
- How likely are these things to happen? (probabilities of scenarios)
- What are the outcomes of these things happening? (consequences of scenarios)

These risk assessments can be applied to waste generation, characterization, storage, packaging, treatment, transportation, and disposal.

Rock Blasting Computer Simulations

A discrete element code [DMC_BLAST] that performs a coupled calculation involving gas flow and the particle motion to model the movement of rock during a blast.

Sandia Environmental Decision Support System (SEDSS)

A methodology and tool for risk assessment, site characterization, and comparison of alternatives for environmental remediation, providing a generalized probabilistic framework for making consistent, technically-defensible, and traceable decisions.

Shear Strain Localization and Fracture Evolution in Rocks

Experimental and analytical study of shear strain localization as a precursor to faulting and macroscopic fracture of rock, development of constitutive models for use in numerical simulations of geologic and man-induced processes in the earth.

Simulating Powder Compaction for Ceramic Component Manufacturing

Predictive finite element method numerical modeling technology was developed for the powder pressing process to optimize die geometry and pressing methods for a given powder before a single part is pressed.

SmartSampling™

A risk-based, goal-oriented process that provides an objective and quantitative framework for evaluating and improving alternative remedial designs, for direct mapping of risk levels and cost alternatives, and for real-time decisions as excavation proceeds. The process emphasized graphical products to focus negotiations between the site owners, stakeholders, and regulators.

Visualization and Quantification of Diffusion Processes in Consolidated Materials

A unique, high-resolution x-ray absorption imaging system to visualize and quantify diffusion processes occurring in heterogeneous, opaque systems (i.e rock slabs, natural soils, and ceramic plates). Understanding and predicting matrix diffusion (and its effect on contaminant migration at all scales) can be critical to environmental remediation programs and nuclear waste storage.

Decon Formulation

The Decon Formulation neutralizes chemical warfare agents quickly without toxic byproducts. It is also effective in quickly killing biological warfare agents as well as biological contamination that impacts food safety and human health. Low-liquid decontamination of walls is possible since the foam clings to most wall surfaces.

Electrokinetic Remediation of Metals

In situ removal of heavy-metal contaminants by implantation of electrodes into the ground and imposition of direct current between the electrodes.

In Situ Reactive Barrier Systems

A reactive subsurface barrier is produced by emplacing a reactant material in the flow path of the contaminated groundwater, which removes and/or transforms the contaminant(s) to regulatory acceptable levels.

Thermal Enhanced Vapor Extraction System (TEVES)

TEVES uses electromagnetic and radiofrequency heating of soil to volatilize and vapor extract contamination from soils. Applications are targeted for high concentrations of contamination (including non-aqueous phase liquids) and semi-volatile chemical compounds.

Related Projects, Facilities and Other Capabilities

PROJECTS

Greater Confinement Disposal Project

Iterative Performance Assessment methodology which focuses work on uncertainty reduction in a cost-effective fashion for the disposal of Greater than Class C low-level waste at the Nevada Test Site.

Mixed Waste Landfill Accelerated Site Technology Deployment

Deployment of an evapotranspiration landfill cover system with an integrated fiber-optic performance monitoring system. This soil cover with an engineered vegetative covering is less expensive than the EPA-RCRA baseline cover and clearly superior in reducing the long-term risks of a hazardous and radioactive disposal site.

National Spent Nuclear Fuel Program

Provides technology solutions and guidance to ensure safe, efficient handling, characterization, and disposition of DOE-owned or managed spent nuclear fuel (SNF). Solutions for safe, efficient packaging and transportation, interim and long-term storage, accurate characterization, and compliance with safety and regulatory requirements.

National Transuranic Program

Operation engineering, operation analysis, and discrete-event simulation modeling to support transuranic waste management system optimization. An operation analysis approach examines present methods, generates models, analyzes functions, creates ideal methods, and modifies them for actual practice. Decision analysis techniques are incorporated to prioritize the proposed changes based on workflow improvement, cost/benefit, or other heuristics.

Natural Attenuation Project

Through identification of the mechanistic controls on metal and organic attenuation by irreversible sorption in the subsurface, the project will provide a scientific basis for risk-based corrective actions and more closely tie cleanup efforts to reductions in human health risk.

Navajo Nation US Federal Laboratories Partnership

Formed to foster improved environmental decision making and community outreach, Sandia National Laboratories and the Navajo Nation lead the partnership that includes Los Alamos National Laboratory, Lawrence Livermore National Laboratory, Oak Ridge National Laboratory, US EPA National Risk Management Research Laboratory, the Tribal College Initiative, and the University of New Mexico.

Related Projects, Facilities and Other Capabilities

Nuclear Waste Packaging Consensus Standards Development

Collaborative development of standards for gadolinium-stainless steel alloys and welding of the alloys for new nuclear-waste packaging (NUPAC) standards.

Quality Assurance

Development and application of quality assurance to scientific and engineering activities (characterization, selection, and performance analyses) in the regulatory environment of major nuclear waste programs to provide full, verifiable compliance to requirements .

Records Management

Systematic approach to the identification, creation, capture, organization, maintenance, retrieval, protection, storage, and disposition of records, regardless of media, created or received in the transaction of business. Design, implementation, and maintenance of graded programs that meet defined low-to-high rigor quality assurance requirements.

Transparency

Transparency in the nuclear fuel cycle is the cooperative process of providing outside parties with access to information so they can independently evaluate the safety, security, and legitimate management of nuclear materials. Sandia is a facilitator in the transparency process, offering a comprehensive array of services that enables countries to implement monitoring activities during all stages of the nuclear fuel cycle.

Water Safety, Security, and Sustainability

Development of improved water resource management for agricultural, domestic, industrial, and ecological uses, and improved water conservation, distribution, treatment, and re-use technologies.

- Groundwater, surface-water, and sediment transport modeling research
- Water-monitoring technology development and demonstration
- Renewable energy applications for water pumping and treatment
- Water treatment and desalination research and development
- Water infrastructure physical security
- Water-resource management simulation and modeling

Waste Isolation Pilot Plant Project

The Waste Isolation Pilot Plant (WIPP) is an operational facility for permanent disposal of transuranic (TRU) waste. Sandia, as the WIPP's Scientific Advisor, led site selection and characterization, experimental studies to understand the interaction of TRU waste and the disposal environment, transport of radioactive actinides, and performance assessment modeling of the repository for the 10,000-year regulatory time frame.

Related Projects, Facilities and Other Capabilities

Yucca Mountain Project

Performance assessment for evaluating nuclear waste repositories

- Numerical modeling, field and laboratory testing
- Transparency technologies to facilitate the transfer of information on the characterization, assessment, licensing, and operation of a nuclear waste repository
- Quality assurance programs including data and records management systems that have proven themselves in demonstrating information traceability and retrievability.

FACILITIES

Arid Environmental Technology Center

The center develops and applies technologies that solve subsurface environmental problems and protect water quality in arid regions.

Colloid Geochemistry and Transport Laboratory

Focused on subsurface transport of contaminants, the laboratory uses a systems-level approach to investigate colloid stability in the near- and far-field aqueous transport paths, limitations in the concentrations of contaminants associated with colloidal particles, and interactions between colloidal particles and the porous medium during transport.

Environmental Geographic Information System (EGIS)

Creates customized maps that portray customer data with respect to topographic and environmental settings including geology, soil types, vegetation, wells, contaminant sources, and other environmental and physical characteristics.

Flow Visualization and Processes Laboratory

The “Flow Lab” supports collaborative integrated basic research incorporating both experimentation in the field and laboratory with a variety of basic to applied modeling approaches that spans multiple applied problems, processes, media and scales.

Geochemistry Laboratory

Metal or radionuclide speciation-solubility in high ionic strength environments, repository and backfill chemistry, reactive transport experiments and modeling, waste-water interactions, environmental application of nano-structured materials, investigation of mechnaical and hydrologic properties of disturbed rock zones.

Related Projects, Facilities and Other Capabilities

In Situ Sensing Laboratory

Testing of chemical sensors for subsurface and *in situ* applications.

- Two Agilent 60-channel data acquisition systems
- Micro gas chromatograph for analysis of volatile organic compounds
- One-dimensional and two-dimensional experimental apparatus for testing sensors in simulated geologic environments

Soil-Actinide-Metal Interaction Analysis and Modeling Laboratory

In support of risk assessment and environmental remediation, the lab investigates the release and transport of radioactive and hazardous materials through the geosphere and engineered barriers using analytical studies, bench-scale transport experiments and process-level computer simulation of radionuclide and toxic metal transport.

Soil and Sediment Transport Laboratory

Design and performance of experiments to provide essential information in the development of predictive tools for assessing potential adverse environmental impacts of erosion-inducing events on both marine sediments and surface soils.

- Mobile flume and erosion-testing device

Tomography and Radionuclide Transport Laboratory

Analysis, large-scale testing, experimental and modeling capabilities for characterization, monitoring, and visualization of radionuclide transport in fractured porous media.

Vadose Zone Research and Development Facilities

Basic vadose zone flow and transport processes are investigated in large-scale field experiments where natural hydrologic systems are stressed through controlled infiltration events while dense arrays of instruments monitor essential hydrologic state variables. Improved understanding of complex vadose zone processes is very important to future characterization and remediation of vadose zone contamination.